

**REMARKS**

Claims 1, 4-11, and 24-28 were previously pending. No claims are currently added, canceled, or amended. As a result, claims 1, 4-11, and 24-28 remain pending for examination with claims 1, 4, and 10 being independent claims. No new matter has been added.

**Examiner Interview**

Applicants thank Examiner Menon for the telephone interview granted with Applicants' representatives Peter Lando and Greg Gerstenzang on July 9, 2009. Applicants acknowledge the interview summary issued by the Examiner on July 11, 2009 in which the Examiner suggested providing secondary evidence of non-obviousness of the claimed subject matter.

**Double Patenting**

Claims 1, 4-11, and 24-28 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-4, 6, 7, 9-11, and 13-19 of co-pending Application No. 11/179,391, claims 1-18, 20-25, and 30 of co-pending Application No. 11/316,593, claims 1-10 of co-pending Application No. 11/574,819, claims 1-25 of co-pending Application No. 11/912,859, claims 15-40 of co-pending Application No. 10/569,565, claims 1-25 of co-pending Application No. 10/774,041, and claims 1-11 of co-pending Application No. 10/572,971.

Applicants note that Application No. 10/774,041 was abandoned on June 3, 2009, rendering the double patenting rejection over this application moot.

Applicants respectfully disagree that any of claims 1, 4-11, and 24-28 of the instant application should be rejected on the ground of obviousness-type double patenting. Notwithstanding this traversal, Applicants will submit a terminal disclaimer with respect to the cited co-pending applications once the instant claims are deemed allowable and should these claims as allowed be obvious over the cited claims of the cited co-pending applications.

Rejections Under 35 U.S.C. § 103

Claims 1, 4-11, and 24-28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of U.S. Patent No. 5,403,479 to Smith et al. (hereinafter “Smith”) and/or U.S. Patent No. 5,209,852 to Sunaoka et al. (hereinafter “Sunaoka”) and/or U.S. Patent No. 5,643,455 to Kopp et al. (hereinafter “Kopp”) and/or U.S. Patent Publication No. 2001/0052494 to Cote et al. (hereinafter “Cote”) and/or JP 11076769 (hereinafter “JP ‘769”).

There is no *prima facie* case of obviousness of claims 1, 4-11, and 24-28 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 because the combination of these references is improper. One of ordinary skill in the art would not have been motivated to have made the asserted combination of these references to arrive at the subject matter recited in the claims of the present application.

Further, secondary indicia of non-obviousness provides strong evidence that the claimed subject matter cannot be obvious over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 or over any other combination of references.

**I. One of ordinary skill in the art would not have been motivated to have combined Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 in the manner asserted.**

There can be no *prima facie* case of obviousness of claims 1, 4-11, and 24-28 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 because one of ordinary skill in the art would not have been motivated to have combined these references in the manner asserted.

These five references are directed to fundamentally different and distinct filtration systems and devices, each having specific objectives, structures, and methods of operation. In order to combine these references in such a way as to render obvious any of claims 1, 4-11, and 24-28, the Examiner would have to use hindsight reasoning as a roadmap to pick, choose, and combine various discreet elements of these references. The Examiner has not provided a valid rationale as to why one of ordinary skill in the art

would have combined Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 in the manner asserted. To the contrary, as stated in the Declaration of Dr. Fufang Zha<sup>1</sup> dated October 30, 2009 (hereinafter the “Zha Declaration”), attached as an appendix to this response, one of ordinary skill in the art would have been dissuaded from combining these references in the manner asserted to arrive at the subject matter of any of claims 1, 4-11, and 24-28 for the reasons outlined below.

**A. One of ordinary skill in the art would not have modified Smith in light of any of Sunaoka and/or Kopp and/or Cote and/or JP ‘769 to provide for performing the acts recited in independent claim 1.**

One of ordinary skill in the art would not have been motivated to have combined the teachings of Smith with any of Sunaoka and/or Kopp and/or Cote and/or JP ‘769 to modify Smith to provide for “scouring surfaces of the membranes by flowing bubbles of a first gas past surfaces of the membranes” as recited in independent claim 1. “There is no disclosure or suggestion in Smith that gas scouring would provide any benefits or improve upon the cleaning method disclosed.” (Zha Declaration at para.10). Furthermore, “[i]n an open tank as described in Smith system, gas scouring during chemical cleaning would generate environmentally unfriendly gases” and “for wastewater treatment applications, air scouring during chemical cleaning would create significant foaming that is difficult to control.” (*Id.*). Thus, to provide for gas scouring in the apparatus of Smith would lead to results that one of ordinary skill in the art would seek to avoid.

One of ordinary skill in the art would not have been motivated to have combined the teachings of Smith with any of Sunaoka and/or Kopp and/or Cote and/or JP ‘769 to modify Smith to provide for “applying [a] gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping” of the membrane filtration system as recited in independent claim 1. One of ordinary skill in the art “would have found it desirable to remove as much valuable liquid permeate from the membrane filtration

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<sup>1</sup> This Declaration is being provided in response to the Examiner’s request for evidence of non obviousness of the subject matter claimed in the present application. Dr. Fufang Zha is a well-known expert in the field of water purification technology, and has numerous applications and patents in this field.

system as possible.” “The method of Smith would have advantageously been performed such that permeate would have been drained from the header and/or piping and/or lumens before applying a biocidal gas to the membrane modules” in order “to increase the amount of permeate formed between back flushing cycles, to increase the efficiency of the system.” (Zha Declaration at para. 11). Further, “if liquid permeate were present in the header and/or lumens upon the application of the biocidal gas, some of the biocidal gas could dissolve in permeate remaining in the header and/or lumens. This would be undesirable as the permeate would then carry the dissolved gas through the hollow fiber membranes and into the reservoir in which the membranes are immersed where it could kill beneficial microbes – a result that would be undesirable in the method of Smith.” (*Id.*).

One of ordinary skill in the art would not have been motivated to have combined the teachings of Smith with any of Sunaoka and/or Kopp and/or Cote and/or JP ‘769 to modify Smith to provide for “directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module” as recited in independent claim 1. To [provide for directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module] would render the device of Smith incapable of performing according to the method disclosed in Smith.” To modify the apparatus of Smith “such that the device of Smith could perform this act would render the device incapable of circulating biocidal solution through the lumens of the fibers and returning it to the storage tank 27 as disclosed in Smith.” (Zha Declaration at para. 12). See *Tec Air, Inc. v. Denso Mfg, Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999) citing *In re Spinnoble*, 405 F.2d 578, 587 (CCPA 1969) “If when combined, the references ‘would produce a seemingly inoperative device,’ then they teach away from their combination.” See also *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where the modification would render the device inoperable for its intended purpose).

One of ordinary skill in the art would not have been motivated to have combined the teachings of Smith with any of Sunaoka and/or Kopp and/or Cote and/or JP ‘769 to modify Smith to provide for “backwashing the membranes by displacing at least some

of the portion of liquid permeate through pores in walls of the membranes, the second gas not penetrating into the membrane pores” as recited in independent claim 1. “In the method of Smith a biocidal gas must pass through the pores of the membrane and chemically react with foulant on the outside of the membranes to remove it.” (Zha Declaration at para. 13). Thus, one of ordinary skill in the art would not have been motivated to have made this modification to Smith as it would have rendered the apparatus of Smith inoperable for its intended purpose. (See *Tec Air, Inc. v. Denso Mfg, Mich. Inc.*, cited above).

**B. One of ordinary skill in the art would not have modified Sunaoka in light of any of Smith and/or Kopp and/or Cote and/or JP ‘769 to provide for performing the acts recited in independent claim 1.**

One of ordinary skill in the art would not have been motivated to have combined the teachings of Sunaoka with any of Smith and/or Kopp and/or Cote and/or JP ‘769 to modify Sunaoka to provide for “supplying a second gas through a second gas inlet at a pressure less than a bubble point of the membranes . . . the second gas not penetrating into the membrane pores” as recited in independent claim 1. “The compressed air utilized by Sunaoka would preferably be compressed to a high pressure, e.g. above the bubble point of the membranes, to provide a significant force to remove particles from the membrane pores during backwashing and to reduce the time required for backwashing the membranes.” (Zha Declaration at para. 16). One of ordinary skill in the art would not have believed that the apparatus of Sunaoka could be effectively or efficiently operated with gas supplied to the apparatus below the bubble point of the membranes, and thus would not have been motivated to operate the apparatus of Sunaoka in this manner.

One of ordinary skill in the art would not have been motivated to have combined the teachings of Sunaoka with any of Smith and/or Kopp and/or Cote and/or JP ‘769 to modify Sunaoka to provide for “directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module” as recited in independent claim 1. To make this modification to Sunaoka would have required a significant change the operating

methodology of the disclosed apparatus, increasing the cost and complexity of the disclosed apparatus, while providing no advantages. “To modify the apparatus of Sunaoka [to provide for directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module] would require a significant change to the structure and operation of the disclosed apparatus. This modification . . . would only have increased the complexity and cost of said apparatus, while not providing a solution to any disclosed problem with said apparatus.” (Zha Declaration at para. 16). As such, one of ordinary skill in the art would not have been motivated to have made such a modification to Sunaoka. (See MPEP § 2143.01 VI, “If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).”)

**C. One of ordinary skill in the art would not have modified Kopp in light of any of Smith and/or Sunaoka and/or Cote and/or JP ‘769 to provide for performing the acts recited in independent claim 1.**

One of ordinary skill in the art would not have been motivated to have combined the teachings of Kopp with any of Smith and/or Sunaoka and/or Cote and/or JP ‘769 to modify Kopp to provide for “directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module” as recited in independent claim 1. To make this modification to Kopp would have required a significant change the operating methodology of the disclosed apparatus, increasing the cost and complexity of the disclosed apparatus, while providing no advantages. “To modify the apparatus of Kopp [to provide for directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module] would require a significant change to the structure and operation of the disclosed apparatus. This modification . . . would only have increased the complexity and cost of said apparatus, while not providing a solution to any disclosed problem with said apparatus.” (Zha Declaration at para. 20). As such, one of ordinary skill in the art would not have been

motivated to have made such a modification to Kopp. (*See* MPEP § 2143.01 VI, cited above).

**D. One of ordinary skill in the art would not have modified Cote in light of any of Smith and/or Sunaoka and/or Kopp and/or JP ‘769 to provide for performing the acts recited in independent claim 1.**

One of ordinary skill in the art would not have been motivated to have combined the teachings of Cote with any of Smith and/or Sunaoka and/or Kopp and/or JP ‘769 to modify Cote to provide for “isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet when the filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid” as recited in independent claim 1. “To have modified the apparatus of Cote to provide for isolating the lumens of the membranes, the manifold, and a portion of piping through which permeate is withdrawn during filtration as recited in claim 1 of the present application would have made it impossible to deliver permeate from the permeate storage tank through the permeate pump, backwash valve, and associated piping to effect backwash as disclosed.” (Zha Declaration at para. 23). Thus, to make such a modification to Cote would have made the apparatus disclosed in Cote non-functional for its intended purpose, which is not something that one of ordinary skill in the art would have been motivated to do. (*See Tec Air, Inc. v. Denso Mfg, Mich. Inc.* cited above).

One of ordinary skill in the art would not have been motivated to have combined the teachings of Cote with any of Smith and/or Sunaoka and/or Kopp and/or JP ‘769 to modify Cote to provide for “supplying a second gas through a second gas inlet at a pressure less than a bubble point of the membranes,” “applying the second gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping by introducing the second gas through the second gas inlet into the filtration system on a side of the valve in direct fluid communication with the membrane module,” “backwashing the membranes by displacing at least some of the portion of

liquid permeate through pores in walls of the membranes, the second gas not penetrating into the membrane pores,” or “venting the second gas from the isolated lumens, manifold, and portion of piping” as recited in independent claim 1. This is because the apparatus disclosed in Cote does not utilize any gas for performing backwashing. To modify the apparatus of Cote such that it used a gas in a backwashing operation would be to fundamentally alter the nature and function of the apparatus disclosed, which is not something one of ordinary skill in the art would have been motivated to do. (*See* MPEP § 2143.01 VI, cited above). “[One of ordinary skill in the art] would not have been motivated to have modified the system of Cote such that it was capable of performing a method including supplying a gas into membrane fibers at a pressure less than a bubble point of the membranes, applying a gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping through a gas inlet on a side of a valve in direct fluid communication with the membrane module, introducing a gas into the membranes which does not penetrate into the membrane pores, or venting gas from the isolated lumens, manifold, and portion of piping. To make a modification to the system of Cote such that it could perform these acts recited in independent claim 1 of the present application would require a fundamental change to the structure and operation of the apparatus of Cote while providing no further benefit or providing a solution to any disclosed problem with said apparatus.” (Zha Declaration at para. 24).

**E. One of ordinary skill in the art would not have modified JP ‘769 in light of any of Smith and/or Sunaoka and/or Kopp and/or Cote to provide for performing the acts recited in independent claim 1.**

One of ordinary skill in the art would not have been motivated to have combined the teachings of JP ‘769 with any of Smith and/or Sunaoka and/or Kopp and/or Cote to modify JP ‘769 to provide for “isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet when the filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid” as recited in independent claim 1. “[One of ordinary skill in the art] would not have been



motivated to have modified the system of JP ‘769 such that it was capable of performing a method including isolating the lumens of the membranes, the manifold, and a portion of piping through which permeate is withdrawn during filtration when the filtration process is stopped. Making this modification to JP ‘769 would have made it impossible for the apparatus of JP ‘769 to deliver permeate from the permeate tank 13 through the pump 15 to backwash the membranes as disclosed.” (Zha Declaration at para. 27). Thus, to make such a modification to JP ‘769 would have made the apparatus disclosed non-functional for its intended purpose, something that one of ordinary skill in the art would not have been motivated to do. (See *Tec Air, Inc. v. Denso Mfg, Mich. Inc.*, cited above).

One of ordinary skill in the art would not have been motivated to have combined the teachings of JP ‘769 with any of Smith and/or Sunaoka and/or Kopp and/or Cote to modify JP ‘769 to provide for “scouring surfaces of the membranes by flowing bubbles of a first gas past surfaces of the membranes” as recited in independent claim 1. “JP ‘769 is directed to a method of cleaning a membrane filtration module with permeate backwashing and occasional cleaning with a ‘drug solution.’ There is no indication or suggestion that any form of aeration would provide any benefits over the backwashing or cleaning with the drug solution disclosed. Adding an aeration system to the apparatus disclosed would increase the cost and complexity of the system while providing no further benefit or providing a solution to any disclosed problem with said apparatus.” (Zha Declaration at para. 28). Thus, to make the asserted modification to JP ‘769 would have increased the cost and complexity of the apparatus disclosed while providing no expected benefit.

One of ordinary skill in the art would not have been motivated to have combined the teachings of JP ‘769 with any of Smith and/or Sunaoka and/or Kopp and/or Cote to modify JP ‘769 to provide for “applying the second gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping by introducing the second gas through the second gas inlet into the filtration system on a side of the valve in direct fluid communication with the membrane module” as recited in independent claim 1. To do so would have required making a fundamental change to the structure and operating principals of the apparatus disclosed in JP ‘769, while providing no expected benefit,

something one of ordinary skill in the art would not have been motivated to do. (*See* MPEP § 2143.01 VI, cited above). “In [JP ‘769], it appears that gas is applied directly to a membrane module after the membrane module has been removed from a filtration assembly (FIG. 1) and attached to a chemical cleaning assembly (FIG. 2). There is no disclosure or suggestion that any permeate remains in the lumens or manifold of the membrane module when attached to the chemical cleaning apparatus, nor is there any disclosure or suggestion that permeate is present in any piping of the chemical cleaning apparatus. Further, I would not have been motivated to have combined the chemical cleaning apparatus of FIG. 2 of JP ‘769 with the filtration assembly of FIG. 1 and perform a method including applying a gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping through a gas inlet on a side of a valve in direct fluid communication with the membrane module because this would require a fundamental change to the system and operation of the apparatus of [JP ‘769], and further because there would be no benefit or advantage to applying the gas to anything but the membrane module as illustrated.” (Zha Declaration at para. 29).

One of ordinary skill in the art would not have been motivated to have combined the teachings of JP ‘769 with any of Smith and/or Sunaoka and/or Kopp and/or Cote to modify JP ‘769 to provide for “directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module” as recited in independent claim 1. To do so would have required making a fundamental change to the structure and operating principals of the apparatus disclosed in JP ‘769, while providing no expected benefit, something which one of ordinary skill in the art would not have been motivated to do. (*See* MPEP § 2143.01 VI, cited above). “To direct the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module would appear to be impossible in the system of [JP ‘769], and could not be accomplished without fundamentally altering the configuration and operation of the apparatus disclosed while providing no further benefit or providing a solution to any disclosed problem with said apparatus.” (Zha Declaration at para. 30).

Accordingly, there can be no *prima facie* case of obviousness of independent claim 1 over Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 because, as evidenced by the statements made in the Zha Declaration, one of ordinary skill in the art would not have been motivated to have combined these references in the manner asserted to arrive at the subject matter claimed in independent claim 1. Dependent claims 24-28 each depend from independent claim 1, and there can be no *prima facie* case of obviousness of these claims over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 for at least the same reasons as independent claim 1.

Independent claim 4 recites claim elements including “isolating the lumens, the manifold, a gas inlet, and a portion of piping when the filtration process is suspended, the lumens, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens, the manifold, and the portion of piping consist of those through which permeate is withdrawn,” “directing liquid permeate present in the isolated manifold and portion of piping into the lumens through a first end of the filtration membranes and through a second end of the filtration membranes,” and “applying a gas at a pressure below a bubble point of the filtration membranes to the liquid permeate to displace at least some of the liquid permeate through the pores in the walls of the filtration membranes in a direction opposite to that of filtration, the gas not penetrating into the membrane pores.” These elements of independent claim 4 are similar to the elements of independent claim 1 discussed above. As such, there is no *prima facie* case of obviousness of independent claim 4, and the claims that depend therefrom (dependent claims 5-9 and 11) over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 for at least the same reasons as there is no *prima facie* case of obviousness of independent claim 1 over the asserted combination.

Independent claim 10 recites a process similar to that recited in independent claim 1, but with the method adjusted for performing filtration from the outside of membrane fibers inward instead of from the inside of membrane fibers outward as recited in independent claim 1. Accordingly, there can be no *prima facie* case of obviousness of independent claim 10 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP ‘769 for similar reasons as there can be no

*prima facie* case of obviousness of independent claim 1 over this asserted combination of references.

**II. Secondary indicia of non-obviousness evidence that the claimed subject matter is non-obvious.**

Even if a *prima facie* case of obviousness of any of claims 1, 4-11, and 24-28 were to have been established, this *prima facie* case would be overcome by secondary indicia of non-obviousness of the subject matter of these claims.

Evidence of commercial success of products operating in accordance with the claimed subject matter, provided in the Declaration of Bruce Biltoft, signed October, 22, 2009 (hereinafter the “Biltoft Declaration”), attached as an appendix to this response, demonstrate that the subject matter claimed in the present application cannot be obvious<sup>2</sup>.

Hollow fiber membrane filtration systems which operate in accordance with the methods recited in claims 1, 4-11, and 24-28 provide advantages over competing membrane filtration systems. These advantages have led to the commercial success of said systems.

Providing filtration systems capable of performing the acts recited in claims 1, 4, and 10, for example, “isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet when the filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid” (claims 1 and 4), applying a gas at a pressure below the bubble point of the membranes to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping (claims 1 and 4), “applying a gas at a pressure below a bubble point of the filtration membranes to liquid permeate remaining within the shell side of the pressure

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<sup>2</sup> This Declaration is also being provided in response to the Examiner’s request for evidence of non obviousness of the subject matter claimed in the present application referred to above. As stated in the MPEP, office personnel should consider all rebuttal evidence presented by applicants, including evidence of secondary considerations indicative non obviousness of claimed subject matter, for example, evidence of the commercial success of products operating in accordance with claimed methods. MPEP § 2145.

vessel, the liquid permeate remaining within the shell side of the pressure vessel consisting of the liquid permeate formed on the shell side of the pressure vessel, to displace at least some of the liquid permeate through the filtration membrane pores in a direction opposite to that of filtration, the gas not penetrating into the membrane pores” (claim 10), and backwashing the membranes by displacing at least some of the portion of liquid permeate through pores in walls of the membranes, the second gas not penetrating into the membrane pores (claims 1 and 4) result in reduced capital cost, reduced operating cost, and increased efficiency for such systems versus competing filtration systems.

“[P]erforming a method including [the acts recited in independent claims 1, 4, and 10 of the present application] permits the elimination of any backwash pump and tank for holding the permeate for backwash of the system. This provides for a reduced capital cost as opposed to systems including a backwash pump and permeate holding tank. Elimination of the backwash pump and permeate holding tank reduces the capital cost from that of a typical membrane filtration system by approximately 5%.” (Biltoft Declaration at para. 5).

Further, systems operating in accordance with the claimed subject matter operate with backwash time “reduced by approximately 5%, resulting in an increased operating efficiency of approximately 1%” versus competing filtration systems (Biltoft Declaration at para. 6).

Additionally, systems operating by “directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module” as recited in independent claim 1 or by “directing liquid permeate present in the isolated manifold and portion of piping into the lumens through a first end of the filtration membranes and through a second end of the filtration membranes” as recited in independent claim 4 produce significantly less backwash waste than competing filtration systems. To operate membrane filtration systems in accordance with these acts as recited in independent claims 1 and 4 of the present application “provides for reducing the amount of liquid backwash waste when compared

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“[T]he applicant should establish a nexus between the rebuttal evidence and the claimed invention, i.e., objective evidence of nonobviousness must be attributable to the claimed invention.” *Id.*

to systems where permeate for backwashing is supplied from a permeate tank. This allows the systems operating in accordance with the methods claimed in the present application to operate in an environmentally-friendly manner. This also allows [such] systems . . . to operate at a lower cost than competing systems which generate more backwash waste which is typically further treated or disposed of at additional cost. Backwash waste is typically 20% less.” (Biltoft Declaration at para. 7).

Even further, “utilizing a gas to push permeate through the pores of the membranes of the membrane module instead of a permeate pump provides for low energy operation” (Biltoft Declaration at para. 8) and “backwashing by directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module provides for uniform backwash cleaning along the length of the fiber membranes utilized” (Biltoft Declaration at para. 9). These effects “provide[] for both environmentally-friendly and low cost operation” and “permits the membrane module to operate at a higher efficiency and decreases the operating cost.” (Biltoft Declaration at para. 8-9)

The advantages resulting from the operation of membrane filtration systems in accordance with the methods claimed in the present application have led to the commercial success of such systems. These advantages are touted by the sales and marketing teams when promoting systems operating in accordance with the claimed methods (Biltoft Declaration at para. 11). These advantages have increased customer demand for systems operating in accordance with the claimed methods (Biltoft Declaration at para. 12). This has resulted in a market share for systems operating in accordance with the claimed methods to have reached approximately 25% since their introduction in 2005. (Biltoft Declaration at para. 10 and 13). There has been an increase of 500% in sales of systems operating in accordance with the claimed methods since the year of their introduction. (Biltoft Declaration at para. 14 and 15). Systems operating in accordance with the claimed methods now account for 50% of all sales for hollow membrane filtration systems sold by Siemens Water Technologies Corp. (the assignee of the present application) (Biltoft Declaration at para. 16).

The advantages provided by systems operating in accordance with the subject matter claimed in the current application have thus led to significant commercial success

of these systems. Siemens Water Technologies Corp. has acquired a significant commercial advantage over its competitors by selling systems operating in accordance with the claimed methods.

The commercial success and sales growth of systems operating in accordance with the methods claimed in the current application show that such methods could not have been obvious at the time of their invention.

The Biltoft Declaration thus provides evidence linking the subject matter claimed in the current application to the commercial success of membrane filtration systems operating in accordance with the claimed methods. This evidence of commercial success linked to the claimed subject matter is a strong secondary indication of non-obviousness which would overcome any *prima facie* case of obviousness of said claimed subject matter, should such a *prima facie* case have been established.

Accordingly, because there is no *prima facie* case of obviousness of any of claims 1, 4-11, and 24-28 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP '769, and because even if there were a *prima facie* case of obviousness, the *prima facie* case would fail in the face of the evidence of the commercial success of systems operating in accordance with the methods recited in these claims, claims 1, 4-11, and 24-28 are patentable over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP '769.

Reconsideration and withdrawal of the rejection of claims 1, 4-11, and 24-28 under 35 U.S.C. § 103 over the combination of Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP '769 is respectfully requested.

**CONCLUSION**

In view of the foregoing Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee that is not covered by an enclosed check please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,  
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